

Appendix D

Summary of Observed Monthly
Evaporation Rates
Southern San Joaquin Valley

Summary of Monthly Observed and Calculated
Evapotranspiration Rates
for Several Crops
Southern San Joaquin Valley
1992 – 1996

TABLE D-1
 SUMMARY OF OBSERVED MONTHLY
 EVAPORATION RATES
 SOUTHERN SAN JOAQUIN VALLEY^{1,2}
 1992 - 1996
 (inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	1.35	2.23	4.13	5.94	8.32	9.29	10.03	8.58	6.43	4.35	2.19	1.02	63.86
1992	0.96	2.44	3.35	6.39	8.91	9.80	8.77	8.77	6.74	4.23	2.25	1.36	63.97
1993	1.31	2.47	3.58	5.60	8.40	8.66	9.48	8.29	6.52	4.19	2.33	1.16	61.99
1994	1.49	2.38	4.43	6.48	7.95	9.86	10.04	8.74	6.53	4.75	2.23	1.16	66.04
1995	1.76	1.63	3.59	5.79	7.40	9.62	9.35	8.83	6.58	4.68	2.42	1.27	62.92
1996	1.02	1.79	3.96	7.25	9.08	9.38	10.40	9.65	7.09	4.94	1.99	1.34	67.89
Average ³	1.31	2.14	3.78	6.30	8.35	9.46	9.61	8.86	6.69	4.56	2.24	1.26	64.56
Average ⁴	1.33	2.24	3.82	6.11	8.36	9.45	9.79	8.74	6.68	4.59	2.24	1.29	64.64
Std. Dev. ⁵	0.28	0.43	0.63	0.78	0.67	0.73	0.73	0.58	0.69	0.35	0.32	0.28	4.18
Std. Error ⁶	0.07	0.10	0.14	0.18	0.15	0.17	0.17	0.13	0.16	0.08	0.07	0.06	0.96

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994

Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average of 1992-1996

⁴Average Of 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-2

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - ALFALFA REFERENCE CROP - ETP
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	1.25	2.06	3.79	5.46	7.66	8.54	9.23	7.89	5.92	4.02	2.01	0.95	58.78
1992	0.89	2.23	3.09	5.88	8.20	9.02	8.05	8.08	6.19	3.89	2.08	1.25	58.85
1993	1.21	2.27	3.29	5.15	7.73	7.97	8.72	7.63	6.00	3.85	2.14	1.07	57.03
1994	1.37	2.17	4.08	5.96	7.31	9.08	9.23	8.04	5.99	4.36	2.07	1.08	60.74
1995	1.61	1.52	3.29	5.35	6.80	8.85	8.34	8.38	6.06	4.31	2.23	1.17	57.91
1996	0.94	1.65	3.65	6.66	8.35	8.62	9.57	8.89	6.51	4.55	1.83	1.22	62.44
Average ³	1.20	1.97	3.48	5.80	7.68	8.71	8.78	8.20	6.15	4.19	2.07	1.16	59.39
Average ⁴	1.22	2.06	3.52	5.62	7.69	8.67	8.99	8.07	6.12	4.22	2.05	1.17	59.40
Std. Dev. ⁵	0.26	0.41	0.58	0.72	0.59	0.66	0.69	0.56	0.60	0.30	0.30	0.26	3.76
Std. Error ⁶	0.06	0.09	0.13	0.17	0.13	0.15	0.16	0.13	0.14	0.07	0.07	0.06	0.86

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
²Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-3

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - GRASS REFERENCE CROP - PET
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	0.96	1.69	3.16	4.62	6.48	7.25	7.81	6.70	4.99	3.31	1.61	0.75	49.33
1992	0.69	1.83	2.57	4.97	6.95	7.63	6.85	6.84	5.23	3.20	1.66	0.95	49.37
1993	0.93	1.85	2.74	4.36	6.55	6.76	7.39	6.47	5.06	3.17	1.71	0.83	47.82
1994	1.08	1.79	3.39	5.06	6.20	7.68	7.83	6.83	5.05	3.59	1.61	0.84	50.95
1995	1.18	1.22	2.74	4.50	5.54	7.49	7.30	6.89	5.08	3.52	1.73	0.90	48.09
1996	0.74	1.34	3.03	5.75	7.13	7.40	8.11	7.53	5.48	3.74	1.46	0.94	52.65
Average ³	0.92	1.61	2.89	4.93	6.47	7.39	7.50	6.91	5.18	3.44	1.63	0.89	49.76
Average ⁴	0.96	1.70	2.91	4.75	6.54	7.33	7.57	6.79	5.14	3.43	1.64	0.91	49.67
Std. Dev. ⁵	0.20	0.30	0.47	0.59	0.50	0.55	0.60	0.49	0.49	0.26	0.22	0.19	3.20
Std. Error ⁶	0.05	0.08	0.14	0.17	0.13	0.16	0.17	0.15	0.16	0.07	0.07	0.06	0.99

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994

Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-4

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - ALFALFA HAY
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	1.03	1.70	3.13	4.51	6.32	7.06	7.62	6.51	4.90	3.31	1.67	0.79	48.55
1992	0.74	1.85	2.55	4.85	6.77	7.45	6.70	6.67	5.19	3.21	1.71	1.04	48.73
1993	0.99	1.87	2.74	4.26	6.38	6.59	7.20	6.30	4.95	3.19	1.77	0.88	47.12
1994	1.12	1.81	3.36	4.92	6.05	7.50	7.62	6.65	4.96	3.60	1.69	0.90	50.18
1995	1.34	1.25	2.72	4.41	5.61	7.32	7.11	6.70	5.00	3.56	1.84	0.96	47.82
1996	0.63	1.50	3.01	5.50	6.90	7.14	7.89	7.33	5.39	3.76	1.52	1.01	51.58
Average ³	0.96	1.66	2.88	4.79	6.34	7.20	7.30	6.73	5.10	3.46	1.71	0.96	49.09
Average ⁴	1.00	1.71	2.90	4.64	6.37	7.15	7.45	6.64	5.04	3.48	1.70	0.98	49.06
Std. Dev. ⁵	0.23	0.31	0.48	0.59	0.50	0.53	0.56	0.48	0.52	0.24	0.23	0.21	3.13
Std. Error ⁶	0.18	0.37	0.69	1.22	1.63	1.75	1.88	1.72	1.25	0.89	0.38	0.22	0.72

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-5

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - COTTON
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal				0.32	1.74	5.60	9.73	8.43	4.75	1.02			31.59
1992				0.49	1.89	5.77	8.60	8.49	4.55	0.57			30.36
1993				0.33	1.70	5.45	9.18	8.12	4.75	0.47			30.00
1994				0.53	2.27	7.36	10.00	8.28	4.04	0.42			32.90
1995				0.21	1.25	5.14	8.83	8.75	5.21	1.45			30.84
1996				0.57	2.12	6.37	10.28	9.30	4.77	0.77			34.18
Average ³				0.43	1.85	6.02	9.38	8.59	4.66	0.74			31.67
Average ⁴				0.43	1.90	5.88	9.51	8.48	4.62	0.74			31.56
Std. Dev. ⁵				0.17	0.43	0.91	0.77	0.57	0.51	0.41			2.23
Std. Error ⁶				0.04	0.10	0.21	0.18	0.13	0.12	0.09			0.51

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
 Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-6
 SUMMARY OF CALCULATED MONTHLY
 EVAPOTRANSPIRATION RATES - CITRUS TREES
 SOUTHERN SAN JOAQUIN VALLEY^{1,2}
 1992 - 1996
 (inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	0.81	1.30	2.33	3.32	4.61	4.88	5.23	4.46	3.34	2.42	1.24	0.60	34.54
1992	0.56	1.44	1.89	3.57	4.96	5.14	4.58	4.55	3.54	2.32	1.27	0.78	34.60
1993	0.79	1.46	2.01	3.14	4.67	4.54	4.93	4.31	3.41	2.34	1.30	0.65	33.55
1994	0.90	1.39	2.49	3.62	4.40	5.17	5.23	4.55	3.41	2.66	1.23	0.67	35.72
1995	1.08	0.98	2.01	3.24	3.96	5.02	4.85	4.60	3.44	2.60	1.34	0.72	33.84
1996	0.62	1.03	2.23	4.13	5.05	4.94	5.41	5.01	3.74	2.76	1.12	0.75	36.79
Average ³	0.79	1.26	2.13	3.54	4.61	4.96	5.00	4.60	3.51	2.54	1.25	0.71	34.90
Average ⁴	0.79	1.31	2.14	3.43	4.63	4.93	5.09	4.55	3.47	2.57	1.25	0.72	34.88
Std. Dev. ⁵	0.18	0.24	0.36	0.44	0.36	0.37	0.38	0.33	0.34	0.18	0.17	0.16	2.26
Std. Error ⁶	0.04	0.06	0.08	0.10	0.08	0.08	0.09	0.08	0.08	0.04	0.04	0.04	0.52

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
²Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

³Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

⁴Average 1992-1996

⁵Average 1977-1976

⁶Values represent 1977-1996 years

TABLE D-7

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES- DECIDUOUS ORCHARD
(CLEAN CULTIVATED)
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal			1.68	3.25	5.38	6.62	7.52	6.42	4.60	2.65	0.92		39.04
1992			1.29	3.49	5.73	6.96	6.61	6.59	4.86	2.57	0.87		38.97
1993			1.38	3.09	5.41	6.21	7.10	6.21	4.66	2.51	0.88		37.45
1994			1.40	3.41	5.00	6.91	7.50	6.56	4.74	2.94	1.06	0.03	39.55
1995	0.13		1.71	3.34	4.75	7.05	7.00	6.62	4.50	2.64	0.82		38.56
1996			1.81	4.16	5.98	6.82	7.80	7.23	4.97	2.91	0.70		42.38
Average ³	0.03	1.52	3.50	5.37	6.79	7.20	6.64	4.75	2.71	0.87	0.01		39.39
Average ⁴	0.01	1.58	3.38	5.44	6.74	7.34	6.57	4.72	2.75	0.77			39.30
Std. Dev. ⁵	0.03	0.31	0.44	0.45	0.51	0.56	0.47	0.47	0.20	0.22	0.01		2.56
Std. Error ⁶	0.01	0.07	0.10	0.10	0.12	0.13	0.11	0.11	0.05	0.05	0.00		0.59

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-8

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - DECIDUOUS ORCHARDS
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
(WITH COVER CROP)
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	0.97	1.68	3.32	5.05	7.64	8.72	9.47	7.97	5.71	3.57	1.65	0.73	56.48
1992	0.69	1.84	2.68	5.54	8.18	9.18	8.32	8.16	6.03	3.47	1.69	0.95	56.73
1993	0.93	1.85	2.88	4.87	7.72	8.14	8.95	7.70	5.77	3.42	1.74	0.82	54.79
1994	1.08	1.80	3.56	5.62	7.31	9.26	9.48	8.12	5.77	3.92	1.65	0.90	58.47
1995	1.28	1.24	2.87	4.94	6.52	9.02	8.83	8.20	5.80	3.81	1.76	0.90	55.17
1996	0.76	1.35	3.23	6.46	8.43	8.90	9.83	8.92	6.21	4.02	1.47	0.94	60.52
Average ³	0.95	1.62	3.04	5.49	7.63	8.90	9.08	8.22	5.92	3.73	1.66	0.90	57.14
Average ⁴	0.96	1.69	3.08	5.32	7.71	8.85	9.25	8.10	5.84	3.74	1.66	0.89	57.09
Std. Dev. ⁵	0.21	0.31	0.51	0.68	0.63	0.65	0.70	0.58	0.54	0.26	0.23	0.20	3.63
Std. Error ⁶	0.05	0.07	0.12	0.06	0.14	0.15	0.16	0.13	0.12	0.06	0.05	0.05	0.83

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years

TABLE D-9
 SUMMARY OF CALCULATED MONTHLY
 EVAPOTRANSPIRATION RATES - DRY BEANS
 SOUTHERN SAN JOAQUIN VALLEY^{1,2}
 1992 - 1996
 (inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal					1.50	7.71	8.63	2.57					20.41
1992					1.67	8.17	7.54	2.53					19.91
1993					0.76	6.66	8.47	3.71					19.60
1994					0.85	7.56	9.04	3.57					21.02
1995						6.42	8.41	5.11					19.94
1996				0.86	6.65	8.71	4.26						20.48
Average ³				0.17	2.04	7.45	7.54	2.98					20.18
Average ⁴				0.08	1.73	7.77	8.25	2.84					20.67
Std. Dev. ⁵				0.25	1.67	0.76	1.36	1.20					0.91
Std. Error ⁶				0.08	0.53	0.24	0.43	0.38					0.29

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
 Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1986-1996

^{5,6}Values represent 1977-1996

TABLE D-10

SUMMARY OF CALCULATED MONTHLY
EVAPOTRANSPIRATION RATES - SMALL GRAINS
SOUTHERN SAN JOAQUIN VALLEY^{1,2}
1992 - 1996
(inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal	0.60	1.75	3.95	5.59	5.48	0.37						0.14	17.88
1992	0.39	1.85	3.20	6.03	5.50							0.25	17.22
1993	0.57	1.87	3.44	5.26	5.68	0.32						0.25	17.39
1994	0.71	1.86	4.26	6.09	5.08	0.27						0.23	18.50
1995	0.64	1.16	3.39	5.54	5.17	1.03						0.23	17.16
1996	0.40	1.32	3.79	7.00	6.60	0.79						0.19	20.09
Average ³	0.54	1.61	3.62	5.98	5.61	0.48						0.23	18.07
Average ⁴	0.57	1.67	3.61	5.70	5.51	0.34						0.19	17.59
Std. Dev. ⁵	0.16	0.32	0.62	0.71	0.76	0.50						0.06	1.95
Std. Error ⁶	0.04	0.08	0.15	0.17	0.18	0.12						0.01	0.46

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1976

^{5,6}Values represent 1977-1996 years

TABLE D-11
 SUMMARY OF CALCULATED MONTHLY
 EVAPOTRANSPIRATION RATES - VINEYARD
 SOUTHERN SAN JOAQUIN VALLEY^{1,2}
 1992 - 1996
 (inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Normal				0.35	2.47	5.02	6.49	5.66	3.99	1.73	0.40		26.11
1992			0.14	1.71	4.71	6.29	5.81	5.53	2.80	0.87	0.09		27.95
1993			0.17	1.59	4.45	5.60	6.26	5.18	2.66	0.84	0.32		27.07
1994			0.28	1.74	4.30	6.38	6.63	5.44	2.61	0.96	0.36		28.70
1995			0.22	1.64	3.87	6.24	6.17	5.50	2.57	0.94	0.47		27.62
1996			0.19	1.83	4.67	6.03	6.87	6.16	3.06	1.05	0.32		30.18
Average ³			0.20	1.70	4.40	6.11	6.35	5.56	2.74	0.93	0.31		28.30
Average ⁴			0.13	1.30	4.07	5.86	6.45	5.59	3.12	1.13	0.24		27.89
Std. Dev. ⁵			0.10	0.51	0.70	0.64	0.50	0.38	0.46	0.23	0.12		2.03
Std. Error ⁶			0.02	0.12	0.16	0.15	0.12	0.09	0.11	0.05	0.03		0.47

¹Average evaporation from Class "A" pans located in irrigated pasture at Bakersfield 12S and Lamont 2NW 1992-1994
 Average of Bakersfield 12S and Bakersfield 14W 1995 - Bakersfield 12S estimated after November 9 - Bakersfield 14W 1996.

²Data from the Department of Water Resources' District report, "Crop Water Use - A Guide for Scheduling Irrigations in the Southern San Joaquin Valley," September 1980, and annual appendices to that report.

³Average 1992-1996

⁴Average 1977-1996

^{5,6}Values represent 1977-1996 years